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Pre-Flood Hazard Mitigation Plan

for the

Town of Three Forks, City of Bozeman

and Gallatin County

Montana

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June, 1984

Prepared by the

Department of Natural Resources and Conservation

Floodplain Management Section

In Cooperation with the

Town of Three Forks, City of Bozeman

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Introduction

Purpose

The purposes of this Pre-Flood Hazard Mitigation Plan are:

a. to identify general flood hazards in the community;

b. to describe existing efforts to reduce flood damage in identified areas;

c. to guide and encourage local community officials in taking further action as may be reasonably expected to enhance mitigation efforts; and

d. to identify and support applications for financial assistance to implement ideas and suggestions consistent with community objectives which will reduce flood damages.

Scope

This plan identifies opportunities to reduce future damage from the flooding sources identified in the Three Forks, Bozeman and Gallatin County Flood Insurance Studies produced by the Federal Emergency Management Agency. The plan takes a comprehensive look at what has already been done to reduce flood damage and suggests actions that can be taken to reduce the physical and monetary effects of future floods.

Funding

The funding source for the plan was provided under the State Assistance Program (SAP) grant administered by the Federal Emergency Management Agency (FEMA).

The SAP grant allows the Floodplain Management Section of the Department of Natural Resources and Conservation (DNRC) to assist with local community efforts in reducing future flood damage losses.

Authority

Authority for the Town of Three Forks, City of Bozeman and Gallatin County to guide future development in flood-prone areas is provided by:

Town of Three Forks Resolution Number 454, adopted September 9, 1980; amended June 7, 1982.

City of Bozeman Ordinance Number 1097, adopted February 3, 1982.

Gallatin County Resolution Number 84-2, adopted July 31, 1984.

The Montana Floodplain and Floodway Management Act (MCA 76-5)

The National Flood Insurance Act of 1968

The Flood Disaster Protection Act of 1973

Emergency Preparedness - A process to "reduce vulnerability of people and communities of this state to damage, injury, and loss of life and property resulting from natural or man made catastrophes."

Flood - " A general and temporary condition of partial or complete inundation of normally dry land areas from (a) the overflow of streams, rivers, or other inland water bodies; or (b) the unusual and rapid accumulation or runoff of surface waters from any source."

Emergency Preparedness

The Gallatin County emergency response plan identifies recommended steps for (1) preparation for flood warnings, (2) establishing flood watches, (3) handling flood fighting operations; and (4) restoration to normal following the flood event.

The checklist (see Appendix A) is procedurally complete, consisting of: Step 1 -- Has a flood warning system been established for the community? (horns, sirens or other signals), to Step 12 -- continue monitoring the emergency until relieved. The steps in between are detailed and accurate in describing the response procedures.

Mitigation Recommendations

These recommendations have been developed as assistance and guidance for the local community officials. They are not required actions. However, it is strongly suggested that when achievable, these recommendations be implemented.

Long-term solutions to mitigate flood problems:

a. Increase the public's awareness of the flood hazards and correct construction practices in flood hazard areas. Elevate their knowledge of the flood-prone areas and provide information to reduce flood damages to existing structures. Reinforce the idea of purchasing Federal Flood Insurance as a way of reducing the economic impact of a flood disaster.

b. Continue to enforce the flood damage reduction regulations for new construction and substantial improvements in flood-prone areas identified on the Flood Insurance Rate Maps (FIRM) and Flood Boundary and Floodway Maps developed by the Federal Emergency Management Agency.

Town of Three Forks

NFIP Community Number: 300029

Resolution Number: 454

Adopted Date: September 9, 1980; amended June 7, 1982

FIRM Panel Number: 0001B

Effective Date: November 19, 1980

Identification of Flood Problems

The two principal sources of flooding in Three Forks are the Jefferson River, northwest of town, and the Madison River, on the east side. Flooding from the Jefferson River has usually occurred during the high runoff period in May and June. Flooding from the Madison River has primarily been due to ice jams and the overtopping or failure of protective dikes.

Areas of Concern

These areas were identified by the community officials.

-Ice accumulation on the Madison River east of town at the I-90 bridge.

Existing Mitigation

Levees have been built on both sides of the Madison River east of Three Forks. The east levee is higher than the west levee. During ice jams, failure or overtopping of the west levee can and has occurred. The levees should not be considered adequate to fully protect the Town of Three Forks.

History of Flooding

Records show that several floods from the Jefferson River have equalled or exceeded the 1948 flood in 1899, 1908 and 1927. Flood waters from the 1948 flood entered town from Front Street and covered most of the western part of town for several days. Waters also overtopped the railroad tracks in the same area. Several families were evacuated from their homes and four businesses were flooded.

Flood Protection Measures

The Chicago, Milwaukee, St. Paul and Pacific Railroad bed acts like a levee when flows from the Jefferson River overtop U.S. Highway 10, as in 1948. This protects the main part of town from the Jefferson River floods of a 25-year or less recurrence interval.

The railroad rails and ties have been removed from the bed, possibly lowering the height and reducing its effectiveness. The bed is abandoned and on the market for sale. Since the railroad bed offers some protection as a levee, it may be in the Town's best interest to purchase the right-of-way and maintain it as a protective levee.

The Town of Three Forks is in the Regular Phase of the National Flood Insurance Program and is enforcing comprehensive flood damage reduction regulations. The Town is not enforcing the Montana Floodplain Management Program regulations, however.

Recommended Mitigation Measures

1. Ice accumulation on Madison River

   a. The U.S. Army Corps of Engineers has been contacted to determine if funding is available to evaluate and mitigate the ice accumulation problem. Meanwhile, a plan of action should be developed either to fight the ice accumulation or provide sand bags to affected properties during a flood event.

   b. Considerable rebuilding and protective riprap are needed on the levees along the Madison River. The upper portion of the west levee is particularly vulnerable. A flood control

district is in place (see District Map A) and should raise funds to rehabilitate the existing levee and maintain it. Improvement in the maintenance practices should be encouraged. The U.S.A.C.E. has been contacted to assist in this matter.

c. The U.S. Army Corps of Engineers has completed a study and plan for a protective levee to be constructed on the west side of Three Forks offering protection from Jefferson River floods. Apparently, the property owners were not willing to provide the right-of-way on their part of the funding for the levee. The Town should seriously consider purchasing the C, M SP & P Railroad and use the bed as a levee.

d. Continue to enforce the NFIP Regular Phase minimum floodplain management regulations within the corporate limits of Three Forks. The Town of Three Forks is encouraged to amend its regulations to meet the minimum state floodplain management standards.

City of Bozeman

NFIP Community Number: 300028

Ordinance Number: 1097

Adopted Date: February 3, 1982

FIRM Panel Number: 0001-0004

Effective Date: March 15, 1982

Identification of Flood Problems

Floodflows on the streams in Bozeman are caused primarily by snowmelt and rain in April, May and June. The area is subject to warm, westerly chinook winds that can cause rapid snowmelt. The April 1948 flood was the maximum flood of record caused by quick warm-up and rapid snowmelt. Much of the flooding occurred from farmland runoff.

Areas of Concern

These areas were identified by the community officials:

1. Bridger Creek overflow into the city along Bridger Drive, Zone B, Panels 8 and 9.
2. Bridger Center Drive & Commercial Drive (access cut off) Panel 8.
3. Bohart Lane along I-90 overtopped (access cut off), Panel 8.

4. Several bridges are overtopped by Bear Creek and the East Gallatin River, possibly cutting off access, Panel 13.
5. Bradley Bridge and surrounding area near Sourdough Road are overtopped (access cut off), Panel 16.
6. Privately owned levee along the Riverside Country Club and Golf Course apparently is not adequate to protect against major flooding, Panel 4.

Existing Mitigation

There are no major flood control structures on the East Gallatin River, Bozeman Creek or any other tributaries. There is a minor levee built along the East Gallatin River at the Riverside Country Club. The levee contains the 100-year flood but not the 500-year flood. Channel widening and culvert removal have occurred on Mathew-Bird Creek.

History of Flooding

History indicates that flooding can occur from Bozeman Creek in any season of the year. A sudden downpour can cause flooding in the city independent of Bozeman Creek. Historic flood patterns are changing due to channel modification and development.

According to The Bozeman Chronicle, notable flooding has occurred in Bozeman in April 1893, April 1937, April 1947, April 1948, July 1958, August 1958, March 1960, June 1969, May 1970, January 1974, June 1975, and April 1977.

The 1948 flood was caused by heavy snowfall for two weeks throughout the Gallatin Valley and was followed by a period of warm weather reaching 68^0, resulting in rapid snowmelt and heavy surface runoff. Considerable damage was caused by this flood. This was the maximum flood of record.

Rainfall events and rapid snowmelt appear to be the most significant flood problems.

Flood Protection Measures

At the request of the City of Bozeman, the U.S. Soil Conservation Service is in the process of studying ways to reduce flooding within the city. Their recommendations should be incorporated into this report.

Nonstructural measures of flood control are being utilized to aid in the prevention of future flood damages. The City of Bozeman is enforcing the minimum standards of the NFIP Regular Phase floodplain management regulations and the Montana Floodplain and Floodway Management program.

Recommended Mitigation Measures

1. Bridger Creek overflow shown as Zone B (Panel 8) -- apparently the cause of the flooding is due to an irrigation diversion restricting the flow of the creek.

   a. Determine if the diversion is presently being used for irrigation purposes. If not, investigate the possible removal of the diversion structure.

   b. Determine if funding is available to rebuild or modify the diversion structure. Possible funding sources - MT DNRC Water Development Grant, private funds from diversion structure owners.

   c. Construct a channel to contain the overflow water along Bridger Drive to East Gallatin River. Possible funding sources -- City and County road funds.

2. Bridger Center Drive & Commercial Drive (Panel 8) -- Overflow waters (zone B) from Bridger Creek and East Gallatin River periodically overtop Bridger Drive, Bridger Center Drive and Commercial Drive, cutting off their access.

   a. Improve overflow water control by constructing channels to direct flows back into the East Gallatin River. A combination of channels and small dikes may be required. Possible funding sources - flood control district to be developed or U.S. Soil Conservation Service-566 Program.

b. Elevate the major access roads above the expected flood height. Be sure to incorporate passages to allow waters to return to East Gallatin River and Bridger Creek. Possible funding sources -- City road fund.

3. Bohart Lane along I-90 (Panel 8) shows Bohart Lane as having access from both the west and east sides. This is not the case; the east side is a dead end. In past flooding events, Bohart Lane was overtopped as shown. Residents had to cut through the I-90 boundary fence to have road access.

   a. Develop secondary access from the east side on Bohart Lane. Possible funding sources -- City road fund.

   b. Elevate Bohart Lane and riprap for protection so that road area does not become inundated. This must be done in compliance with the City's Flood Damage Reduction Resolution. Possible funding sources -- City road fund.

4. Bridges along Bear Creek and East Gallatin River cutting off access (Panel 13). Several private drives along Kelly Canyon Road and Story Hill Road have bridges or culverts with inadequate passages that create backwater flooding and overtopping.

a. Contact the owners of the private drives and recommend they improve their passage size to reduce backwater flooding. Possible funding surce -- private funds. When the next flood occurs that washes out or severely damages the private bridges or culverts, require that these be repaired or replaced with passages that pass the 100-year flow.

b. Kelly Canyon Road and Story Hill Road bridges and culverts should be evaluated for rehabilitation or replacement. If repair is needed, determine if increased passage could be incorporated in the repair. If replacement is needed, replacement bridge should be constructed to pass the 100-year flood flow. Possible funding sources -- County road and bridge funds.

5. Bradley Bridge and area (Panel 16) -- Bozeman Creek overtops a private drive and Bradley Bridge, cutting off Candy Lane.

a. Same recommendations as 4 (a) and 4 (b).

6. Privately owned levee along Riverside Country Club (Panel 4). The levee protects the country club, golf course and several homes. Not shown on the FIRM Map, the levee runs north along East Gallatin River.

a. Recommend that private owner have the levee evaluated by a certified engineer to determine what improvements are needed. Any improvements must be in compliance with the City's Flood Damage Reduction Resolution. Possible funding source -- private funds.

Gallatin County

NFIP Community Number: 300027

Ordinance Number: 84-2

Adopted Date: July 31, 1984

FIRM Panel Number: 0001-0900

Effective Date: August 1, 1984

Areas of Concern

These areas were identified by the community officials:

-Madison River east side dike (Darlington Ditch) Panel 10.

-Inadequate culvert and bridge passages (see list).

-Camp Creek flooding over Camp Creek Road (Panels 295 and 400 not printed.)

Existing Mitigation

The West Gallatin River can be considered a wild and natural river until it breaks out of the canyon onto the valley floor. Several irrigation diversions can significantly reduce channel flow, but cannot be depended upon for this purpose. Several minor levees have been built along portions of the main channel to prevent overflow to the west into Baker Canal.

Madison River is controlled to some degree by Hebgen Dam, Quake Lake and Ennis Lake. Hebgen Lake especially can have some modifying effect on peak discharges, depending upon management.

Identification of Flood Problems

Floodflows on streams in Gallatin County are caused primarily by snowmelt and rain in April, May and June. The area is subject to warm, westerly chinook winds that can cause rapid snowmelt.

Flooding can also be caused by ice jams during the winter, especially on the Madison River.

Levees have been built east of Three Forks on both sides of the Madison River. These levees offer limited protection.

The Jefferson River has some dams on its tributaries, but these have little modifying effect on peak discharges. The Chicago, Milwaukee, St. Paul and Pacific Railroad bed acts as a levee when flows from Jefferson River overtop U.S. Highway 10 as in 1948, protecting Three Forks from a 25-year flood.

Gallatin County is enforcing the NFIP Regular Phase Flood Damage Reduction Ordinance and the Montana Floodplain and Floodway Management Act for areas covered by the USACE Special Flood Hazard Information Report - Gallatin River - Gallatin

County report and the U.S.S.C.S. East Gallatin River and Upper Tributaries Flood Hazard Analyses - Gallatin County and the Gallatin County Flood Insurance Study.

These reports have been incorporated in the Gallatin County Flood Insurance Study produced by the Federal Emergency Management Agency except for sections of the East Gallatin River.

History of Flooding

According to The Bozeman Chronicle, notable flooding occurred along Bozeman Creek in April 1893, April 1937, April 1948, July 1958, August 1958, March 1960, June 1969, May 1970, January 1974, June 1975 and April 1977.

April 15, 1948 was the maximum flood of record throughout the East Gallatin River valley after a two-week period of snowfall and then a rapid increase in temperatures reaching 68°. Rapid snowmelt and heavy surface runoff occurred.

Recommended Mitigation Measures

1. Levee on east side of Madison River (Darlington Ditch) (Panel 190). The U.S. Army Corps of Engineers refuses to certify the levee built in 1949 apparently because of its construction and maintenance. There are no construction

plans available for the U.S.A.C.E. to review for certification. The maps show the flow boundary (approximate means) from the 1919 ice jam flood.

a. The East Side Madison Dike and Drain District (see District Map B) needs to have the USACE or a qualified engineering firm evaluate the existing levee to determine the inadequacies. Develop the additional funds to upgrade the levee to USACE standards. Possible funding sources -- Flood Control District or USACE, Section 55 or Section 205.

2. Inadequate Bridge and Culvert Passages. Several bridges and culverts have too small passages and are overtopped during a 100-year flood event.

List of Bridges and Culverts

Panel 190. I-90, Madison River, T2N, R2E, Section 30

Panel 285. I-90, Camp and Baker creeks, T1N, R3E, Section 13 Churchill Road Camp Creek T1N, R3E, Section 35

Panel 305. I-90, West Gallatin River, T1N, R4E, Section 19 Heeb Road Baker Creek and West Gallatin River, T1N, R4E, Sections 19 and 31 (Stagecoach Trail Road)

Panel 315. Amsterdam Road, West Galllatin River, T1S, R4E, Sections 4 and 5, West Cameron Road, Section 21 and 22.(State secondary - County maintained)

Panel 320. Nelson Road, Buster Gulch, T1S, R5E, Sections 9 and 15.(County Road)

Panel 405. Norris Road, West Gallatin River, T2S, R4E, Sections 10 and 11.(State Primary)

Panel 415. Axtell Anceney Road, West Gallatin River, T2S, R4E, Section 34, Gateway Road, Cottontail Road, T3S, R4E, Sections 2 and 10.(County Road)

Panel 430. Bridger Canyon Road, Bridger Creek, T1S, R6E, Section 33.(State Primary)

a. The passages of the above bridges and culverts should be evaluated for rehabilitation or replacement. If repair is needed, determine if increased passage could be incorporated in the repair. If replacement is needed, construct new culvert or bridge to pass the 100-year flood flow. Possible funding sources -- State and County road and bridge funds.

3. Camp Creek and Camp Creek Road. The area of concern is not identified on the FIRM maps. However, the community official identified the concern using a county road map. The creek meanders quite severely, creating the need for several bridges on Camp Creek Road which can and have been overtopped.

a. Realign the road so that the creek is mostly on one side, reducing the number of bridges needed and costs for repair. Possible funding source -- County road funds.

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 Gallatin County (Mont.)
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EMERGENCY ACTION CHECKLIST

No. 2 FLOODS

A. The following actions are recommended for (1) preparation for flood warnings, (2) establishing flood watches, and (3) handling flood fighting operations, and (4) restoration to normal following flood.

1. Has a flood warning system been established for the community? (Horns, sirens or other signals).

2. If flood waters have not arrived has a flood watch been established?

3. Contact Civil Defense Director or Chief Executive to determine whether EOC will be activated and to what extent. Check Emergency Staff Roster.

4. Has a river watch and reporting system been completed?

5. Has the necessary communications been planned and activated for flood emergencies? (E.g. District and State Civil Defense Offices, Weather Service and local emergency services.

6. Are units of local government aware of procedures to request military support? (See Basic Plan, Supporting Agencies, Par. IV.)

7. Check with District or State Civil Defense Office for provisions of Public Law 99, US Army Corps of Engineers regarding preventative assistance in flood control planning.

8. Take immediate action to provide a system through radio and TV to (1) inform the public to stay tuned for advice from local governments; (2) remain calm; (3) quell rumors; and (4) take precautionary measures.

9. Suggested message is as follows:

   Flood information and warning will be issued over KBMN - KXXL - KBOX -

   KGLT Radio and Bozeman Cable TV stations, your local government's advice.

   ________________ and instruction during the emergency will be issued
   date
   over these stations by ____
   (Commissioners
   ____.
   Mayor Civil Defense Director etc.)

10. Make an assessment relating to your departmental responsibility such as; potential risk area, estimate of rise of water based on reported flood watch information, coordinate reports with other agencies and list phone number, locations, and persons you will be in contact with.

11. Suggested actions when EOC is fully activated:

a. List important details of plans and procedures.
b. Advise public of steps to protect lives and property.
c. Quell rumors and maintain morale of public by informing them of conditions and governmental actions being taken.
d. Mobilize all Emergency Services, (Police, Sheriff, Public Works, Engineering, Fire, Health and Welfare, Search and Rescue, etc.)
e. Cause positioning of essential equipment, fuel, food, medical supplies, etc. outside the anticipated flood area.
f. Check and test auxiliary power and lighting equipment.
g. Place mobile communications, antennae and such in place and test.
h. Notify all staff people and volunteers of flood warning and assignment.
i. Advise school officials and recommend cancellation of classes where doubt exists.
j. Condsider all appropriate emergency plans depending on the area affected and include such information as height of water at normal stage; height flooding will occur; areas that may or will be affected by rising water; areas to be evacuated; shelters and their location; feeding and other evacuation requirements.
k. Effect highway and state traffic control plans for movement of mutual aid, military assistance, etc. as available.
l. Provide for patrols in evacuated areas for protection of property, fire prevention, vandalism, utilization of mutual aid, military assistance, etc.
m. Organize use of Search and Rescue units for the most practical use e.g. trapped motorists, areas needing boats, helicopters and special vehicles.
n. Check electrical, gas and water sources and delivery equipment.
o. Keep situation reports from field to EOC for purposes of public information and minimize alarm, keeping area clear and assist in other requirements.

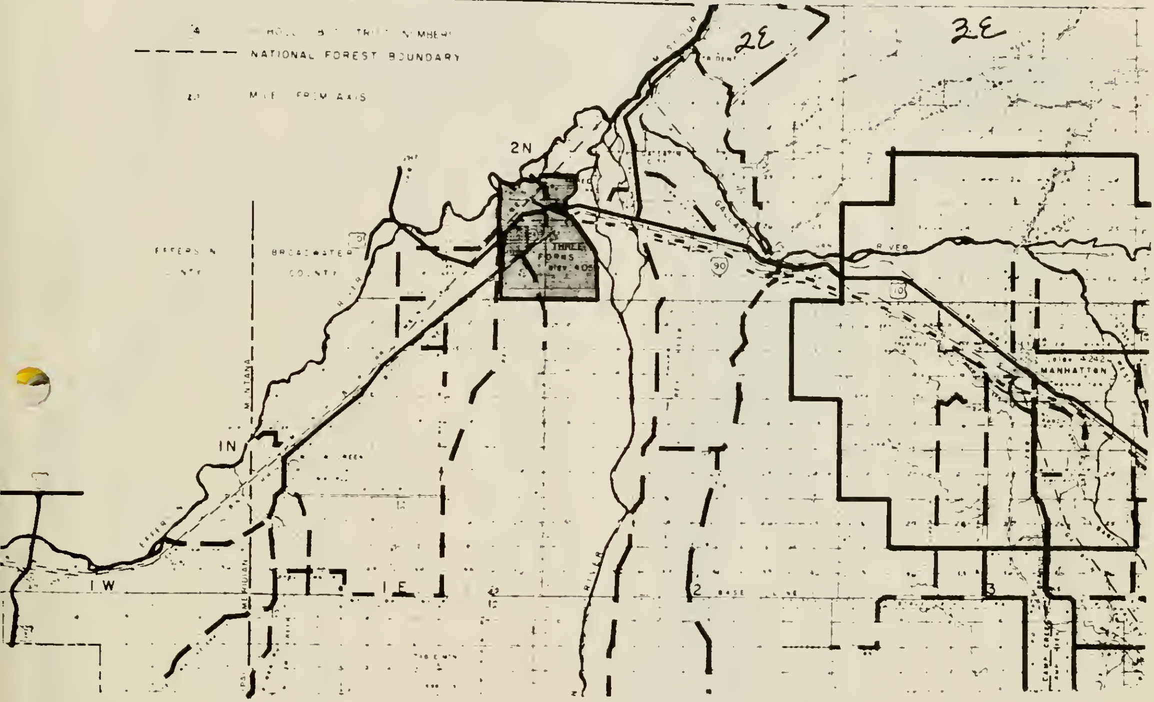
12. Actions to consider during restoration period following flooding. These are suggested priorities since Emergency Services are usually deeply committed and fatigued from long periods of involvement in sandbagging, pumping, shoring structures, controlling vandalism, tending sick and injured, feeding, etc.

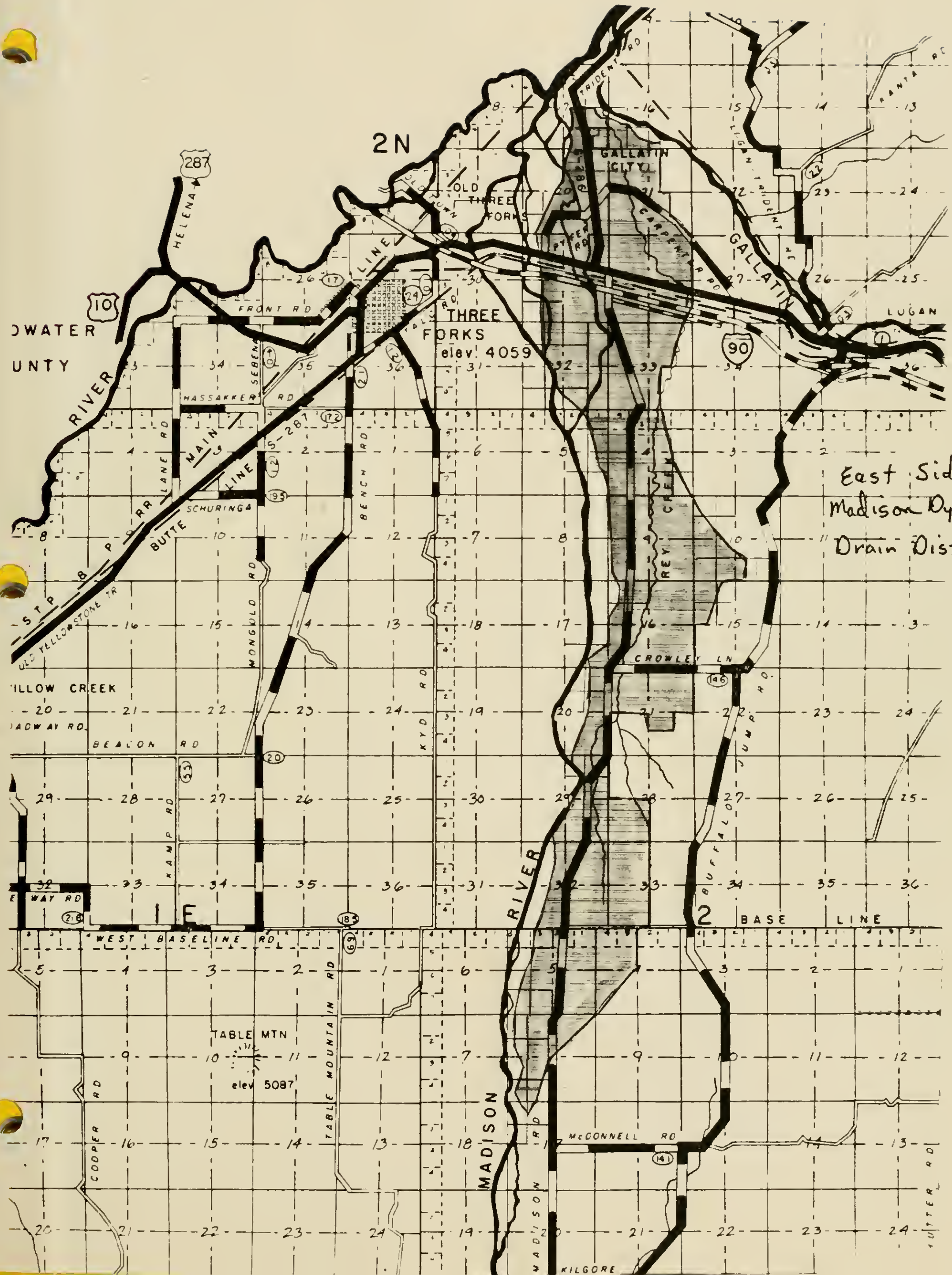
a. Clear main streets and thoroughfares of mud and debris first, followed by secondary streets and roads as soon as possible.
b. Where permissable, pump water from basements and lower floors.
c. Remove garbage and trash collections, particularly food residue as quickly as possible.
d. Start immediate health and sanitation inspections and request needed assistance from State Health Department direct or through District #3 Office.
e. Initiate safety measures to be followed during restoration.
f. Advise public of First Aid and Medical Care stations or areas.
g. Provide information on where to receive assistance for emergency housing, clothing and food, etc.
h. Suggest local measures to help themselves and their community to restore from the emergency.

B. 1. Call Civil Defense and the Mayor, County Commissioners, and City Manager. (See telephone numbers in front of this plan.)

2. Continue to monitor the emergency until relieved. Civil Defense and the Mayor will then take action to notify the public and give aid where necessary.

Three Forks Drainage District





East Side
Madison Dyke +
Drain District